

**Preliminary
Hydrology Study
for
3255 Summit Drive
APN 237-160-06**

Escondido, California
County of San Diego

**PREPARED FOR:
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**PREPARED BY:
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**DATE:
February 8, 2007
Revised: October 16, 2008**

DOUGLAS E. LOGAN, RCE 39726

DATE

This Drainage Study has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

Douglas E. Logan
REGISTERED CIVIL ENGINEER

DATE

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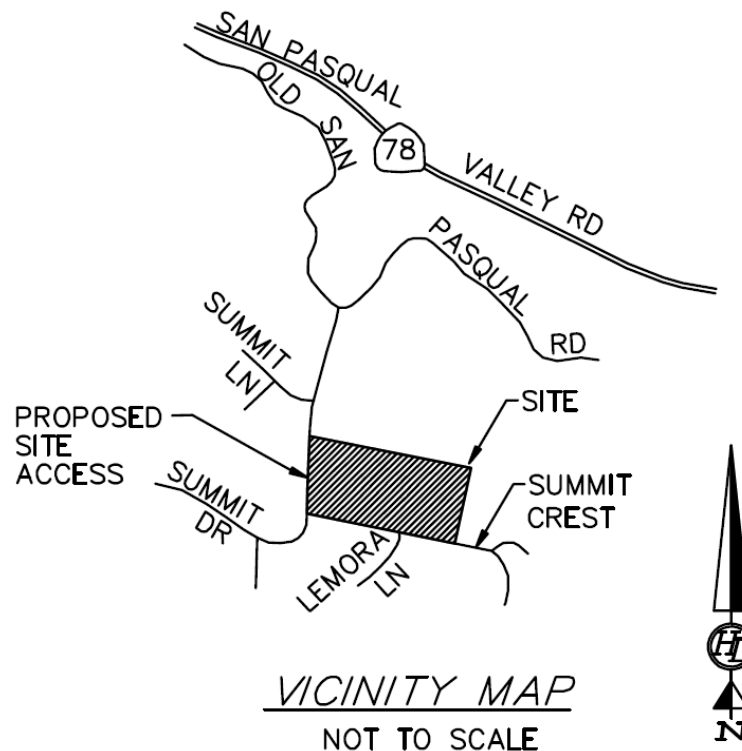
1.0 EXECUTIVE SUMMARY

1.1 Introduction

This Hydrology Study for 3255 Summit Drive, Escondido, has been prepared to analyze the hydrologic characteristics of the existing and proposed project site, and determine the existing condition offsite hydrologic characteristics that are conveyed through the proposed project site. This report intends to present the methodology and the calculations used for determining the runoff from the project site in both the pre-developed (existing) conditions and the post-developed (proposed) conditions, as well as the offsite areas, produced by the 100 year 6 hour storm.

1.2 Existing Conditions

The proposed project site is located off of the east side of Summit Drive, south of SR-78 and Old San Pasqual Road, north of Summit Crest, east of Bear Valley Parkway, and west of San Pasqual Road as shown on the vicinity map below.



The existing site consists of a single family residential structure, located on a single parcel. Drainage from the existing site is primarily conveyed in two directions; the western half of the project site drains to Summit Drive, while the eastern half of the project site drains to a natural unnamed channel that



The project site consists of creating 5 residential parcels and constructing 4 new residential structures. The project design proposes the construction a single private road with a cul-de-sac terminus, the grading of 4 new residential pads, suitable for the construction of 4 new single family residences, as well as the typical improvements associated with residential developments (i.e. water, gas and electric utilities, driveways, storm drain and sewer septic system).

The drainage of the proposed development will essentially maintain the same flow patterns as the existing condition. Earthen swales will be utilized to direct storm water on site safely away from the proposed structures, as well as be utilized as BMP conveyance systems. The intent of storm drain system design was to maintain the existing conditions to the maximum extent practicable.

1.4 Summary of Results

Hydrologic analysis of the pre-developed and post-developed conditions of the proposed project site is included in this report as section 3.1 and 3.2 respectively. The pre-developed and post-developed condition hydrologic model that was developed to analyze the project site includes two points of analysis. Section 3.1 illustrates that the easterly watershed area is equal to 9.75 acres, has a time of concentration (Tc) equal to 9.63 minutes and has a peak discharge in the 100-year 6 hour storm event of 17.74 cfs; while the westerly watershed area is equal to 9.80 acres, has a time of concentration (Tc) equal to 11.2 minutes and has a peak discharge in the 100-year 6 hour storm event of 16.18 cfs. The table below illustrates the model analysis input and output based on the existing conditions:

Existing Condition 100-year storm Characteristics:

NODE (#)	H (feet)	L (feet)	C	Tc (minutes)	I (in/hr)	A (acres)	Q100 (cfs)
11	17	100	0.31	6.601	7.489	0.25	0.58
10	129	862.9	0.31	3.029		9.5	17.28
10				9.63	5.869	9.75	17.74
22	12	100	0.31	6.601	7.489	0.17	0.39
21	56	700.1		2.75			
20	14	493	0.31	1.85	5.325	9.63	15.9
20				11.2		9.8	16.18

In the post-developed condition hydrologic analysis in section 3.2 illustrates that the easterly watershed area is equal to 9.75 acres, has a time of concentration (Tc) equal to 11.77 minutes and has a peak discharge in the 100-year 6 hour storm event of 16.68 cfs; while the westerly watershed area is equal to 9.80 acres, has a time of concentration (Tc) equal to 11.08 minutes and has a peak discharge in the 100-year 6 hour storm event of 16.09 cfs. The table on the following page illustrates the model analysis input and output based on the developed conditions:

Developed Conditon 100-year storm Characteristics:

NODE (#)	H (feet)	L (feet)	C	Tc (minutes)	I (in/hr)	A (acres)	Q100 (cfs)
12	17	100	0.31	6.601	7.489	0.25	0.58
11	99	585.9	0.31	8.66	6.286	3.46	6.74
44	12	100	0.33	6.434	7.614	0.27	0.68
43	20	138.85		0.37			
42	1	48.45		0.55			
41	18	141.65		0.5			
40	23	293		2.21			
11	21	291.59	0.33	1.21	5.306	5.77	10.1
10	30	277.01		11.77		9.75	16.68
22	12	100	0.31	6.601	7.489	0.17	0.39
21	56	700.1	0.31	2.75	5.982	5.45	10.11
20	14	493	0.33	1.73	5.361	0.44	0.73
36	13	100	0.31	6.601	7.489	0.55	1.28
35	16.1	135.8	0.31	0.46	7.173	0.54	1.2
34	0.6	88.52		0.93			
33	0.61	121.17		1.43			
32	10.29	146.62	0.33	0.65	5.704	0.63	1.19
31	0.52	50.45		0.34			
30	2.19	218.91	0.33	2.21	5.077	2.04	3.39
20	5.29	19.67		0.05			
20				11.08		9.8	16.09

1.5 Conclusions

The project site hydrologic models for both the pre- and post-developed conditions encompass a total area of 9.75 acres for the easterly basin and 9.80 acres for the westerly basin, and each condition consists of two separate sub-basins. Evaluating the pre- and post-developed conditions models, the proposed development overall will slightly decrease the amount of runoff discharged from the project site, as compared to the runoff from the site in the existing conditions. The easterly basin (node 10) will see a decrease in peak discharge of 1.06 cfs (17.74 cfs in the existing condition as compared to 16.68 cfs in the developed condition), and the westerly basin (node 20) will see a decrease of 0.09 cfs (16.18 cfs in the existing condition as compared to 16.09 cfs in the developed condition). The decrease at the westerly point of analysis equates to a decrease of roughly 0.6% in the westerly basin and a decrease of roughly 5.98% in the easterly basin.

The proposed storm drain system incorporates the design of the grass-lined BMP swales located on each proposed parcel and will convey storm water over pervious surfaces prior to reaching each respective point of discharge.

The immediate existing downstream drainage facilities appear to be adequate to handle the increase in discharge from the project site. In particular Summit Drive's curb and gutter system appears adequate to handle the increase of 0.03 feet in flow depth from 0.39 feet in the existing condition to 0.42 feet in depth in the developed condition, and the increase, from 13.31 feet of halfstreet flood width, of 1.47 feet to a 14.78 feet halfstreet flood width.

It is the opinion of HL Engineering and Surveying, Inc. that the proposed storm drain system will safely convey the entire 100-year peak flow generated by offsite and onsite runoff.

1.6 References

"San Diego County Hydrology Manual", revised June 2003, County of San Diego, Department of Public Works, Flood Control Section.

2.0 METHODOLOGY

2.1 Introduction

The hydrologic model used to perform the hydrologic analysis presented in this report utilizes the Ration Method (RM) equation, $Q=CIA$. The RM formula estimates the peak rate of runoff based on the variables of area, runoff coefficient, and rainfall intensity. The rainfall intensity (I) is equal to:

$$I = 7.44 \times P_6 \times D^{-0.645}$$

Where:

I = Intensity (in/hr)

P_6 = 6-hour precipitation (inches)

D = duration (minutes – use T_c)

Using the Time of Concentration (T_c), which is the time required for a given element of water that originates at the most remote point of the basin being analyzed to reach the point at which the runoff from the basin is being analyzed. The RM equation determines the storm water runoff rate (Q) for a given basin in terms of flow (typically in cubic feet per second (cfs) but sometimes as gallons per minute (gpm)). The RM equation is as follows:

$$Q = CIA$$

Where:

Q= flow (in cfs)

C = runoff coefficient, ratio of rainfall that produces storm water runoff (runoff vs. infiltration/evaporation/absorption/etc)

I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour.

A = drainage area contributing to the basin in acres.

The RM equation assumes that the storm event being analyzed delivers precipitation to the entire basin uniformly, and therefore the peak discharge rate will occur when a raindrop that falls at the most remote portion of the basin arrives at the point of analysis. The RM also assumes that the fraction of rainfall that becomes runoff or the runoff coefficient C is not affected by the storm intensity, I, or the precipitation zone number.

The 100-year 6-hour and 24-hour Rainfall isopluvials, showing the approximate project location, as well as the Soil Hydrologic Groups map are included at the end of this section.

2.2 County of San Diego Criteria

As defined by the County Hydrology Manual dated June 2003, the rational method is the preferred equation for determining the hydrologic characteristics of basins up to approximately one square mile in size. The County of San Diego has developed its own tables, nomographs, and methodologies for analyzing storm water runoff for areas within the county. The County has also developed precipitation isopluvial contour maps that show even lines of rainfall anticipated from a given storm event (i.e. 100-year, 6-hour storm).

One of the variables of the RM equation is the runoff coefficient, C . The runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area. Each of the categories listed has an associated runoff coefficient, C , for each soil type class.

The County has also illustrated in detail the methodology for determining the time of concentration, in particular the initial time of concentration. The County has adopted the Federal Aviation Agency's (FAA) overland time of flow equation. This equation essentially limits the flow path length for the initial time of concentration to lengths of 100 feet or less, and is dependent on land use and slope.

2.3 Runoff Coefficient Determination

As stated in section 2.2, the runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table, included at the end of this section, categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area.

For the analysis of the project site in both the existing condition and developed condition, the hydrologic model utilized a soil type class of B. Included at the end of this section is both the County Soil Groups Map and an excerpt of the County Soil Groups Map. The project site appears to be located within the soil type Group B hatching shown on both above exhibits.

For the proposed developed condition the total impervious area is roughly equal to 92019.65 square feet or 2.11 acres; while the total watershed areas total roughly 19.56 acres. Using the runoff coefficients shown in Table 3.1 of the County Hydrology Manual, associated with type B soils, a composite "C" value was calculated based on the following:

$$C = \frac{(0.25 * 17.45 \text{ acres})}{\text{Undisturbed area}} + \frac{(0.95 * 2.11)}{\text{impervious area}} = 0.33$$

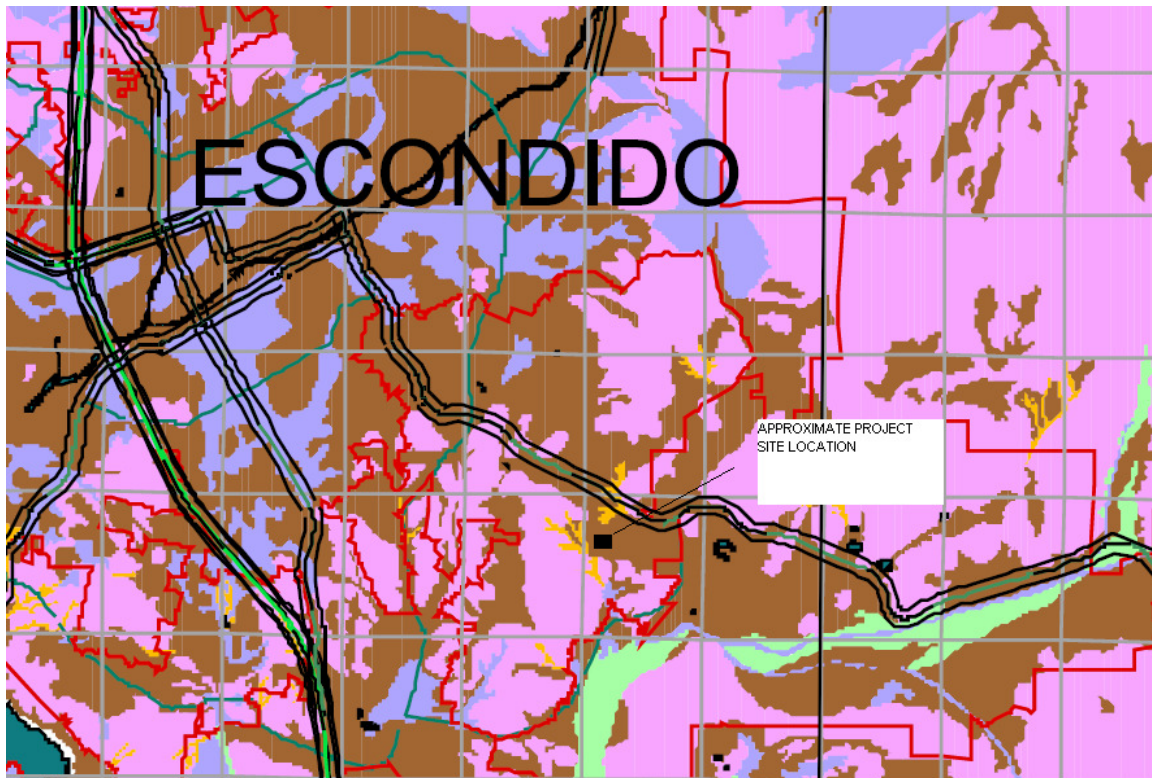
Therefore, the runoff coefficient of 0.33, which corresponds closely to Table 3.1's category of 1 DU/A or less and an impervious ration of 10%, was chosen for the post-developed condition.

For the existing conditions, the total impervious area is roughly equal to 68,592 square feet or 1.57 acres; while the total watershed areas total roughly 19.56 acres. Using the runoff coefficients shown in Table 3.1 of the County Hydrology Manual, associated with type B soils, a composite "C" value was calculated based on the following:

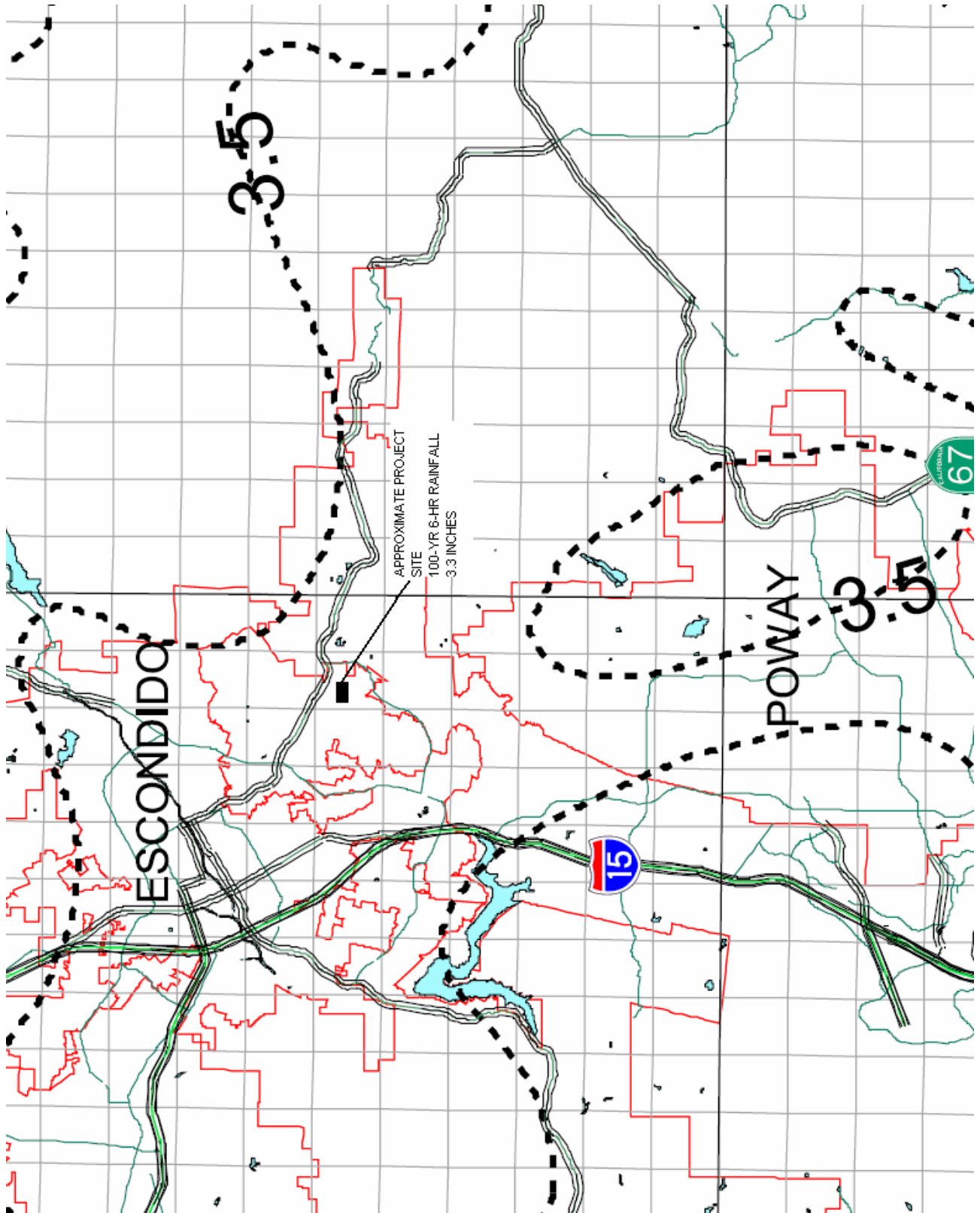
$$C = \frac{(0.25 * 17.98 \text{ acres})}{\text{Undisturbed area}} + \frac{(0.95 * 1.57)}{\text{impervious area}} = 0.31$$

Therefore, the runoff coefficient of 0.31, which corresponds closely to Table 3.1's category of 1 DU/A or less and an impervious ration of 10%, was chosen for the existing condition.

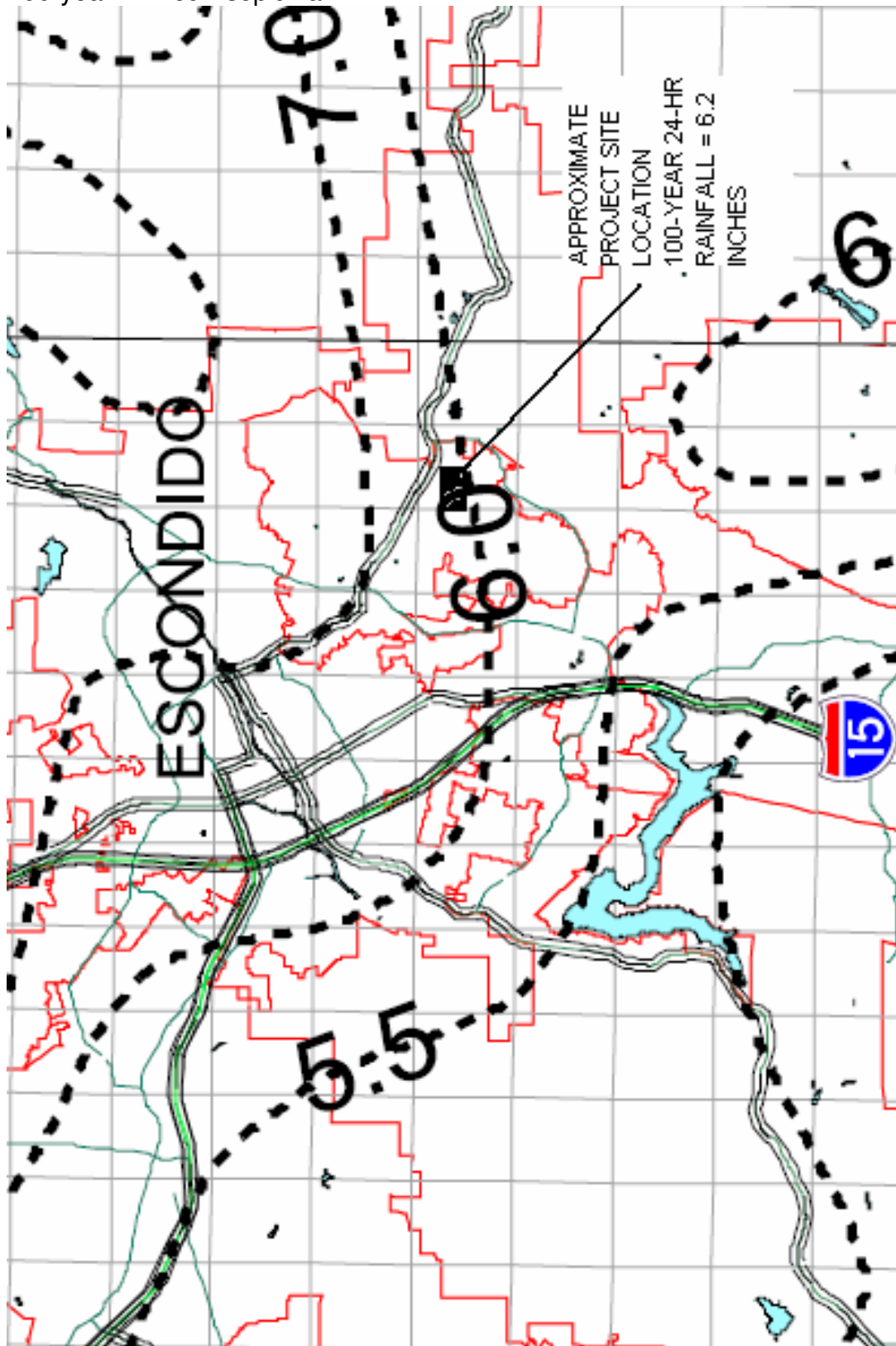
County Soils Map (excerpt from County Soil Groups Map:



100-year 6-hour Isopluvial:



100-year 24-hour Isopluvial:



3.0 Hydrology Model Output

3.1 Pre-Developed Hydrologic Model Output

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2005 Advanced Engineering Software (aes)
Ver. 2.0 Release Date: 06/01/2005 License ID 1574

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* HYDROLOGIC ANALYSIS OF THE 100-YEAR 6-HOUR STORM EVENT FOR: *
* 3255 SUMMIT DRIVE ~ EMBLY - HL #5466 *
* EXISTING CONDITION *

FILE NAME: C:\AES\2007-73\100-EX2.DAT
TIME/DATE OF STUDY: 12:08 08/14/2007

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.400
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150
2	20.0	12.5	0.020/0.020/0.020	0.50	1.50	0.0313	0.125	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 1.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 12.00 TO NODE 11.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 646.00
DOWNSTREAM ELEVATION(FEET) = 629.00
ELEVATION DIFFERENCE(FEET) = 17.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.601
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.489
SUBAREA RUNOFF(CFS) = 0.58

HYDROLOGY REPORT for 3255 Summit Drive

TOTAL AREA(ACRES) = 0.25 TOTAL RUNOFF(CFS) = 0.58

FLOW PROCESS FROM NODE 11.00 TO NODE 10.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	629.00	DOWNSTREAM(FEET) =	500.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	862.90	CHANNEL SLOPE =	0.1495
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION			
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION			
CHANNEL FLOW THRU SUBAREA(CFS) =	0.58		
FLOW VELOCITY(FEET/SEC) =	4.74	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME(MIN.) =	3.03	Tc(MIN.) =	9.63
LONGEST FLOWPATH FROM NODE	12.00	TO NODE	10.00 = 962.90 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 10.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	5.869
*USER SPECIFIED(SUBAREA):	
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.3100
S.C.S. CURVE NUMBER (AMC II) =	82
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3100
SUBAREA AREA(ACRES) =	9.50
SUBAREA RUNOFF(CFS) =	17.28
TOTAL AREA(ACRES) =	9.75
TOTAL RUNOFF(CFS) =	17.74
TC(MIN.) =	9.63

+-----+
| END ANALYSIS OF EASTERLY BASIN |
| BEGIN ANALYSIS OF WESTERLY BASIN |
| |
+-----+

FLOW PROCESS FROM NODE 23.00 TO NODE 22.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA):	
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.3100
S.C.S. CURVE NUMBER (AMC II) =	82
INITIAL SUBAREA FLOW-LENGTH(FEET) =	100.00
UPSTREAM ELEVATION(FEET) =	658.00
DOWNSTREAM ELEVATION(FEET) =	646.00
ELEVATION DIFFERENCE(FEET) =	12.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =	6.601
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!	
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	7.489
SUBAREA RUNOFF(CFS) =	0.39
TOTAL AREA(ACRES) =	0.17
TOTAL RUNOFF(CFS) =	0.39

FLOW PROCESS FROM NODE 22.00 TO NODE 21.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	646.00	DOWNSTREAM(FEET) =	590.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	700.10	CHANNEL SLOPE =	0.0800
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION			
CHANNEL FLOW THRU SUBAREA(CFS) =	0.39		
FLOW VELOCITY(FEET/SEC) =	4.24	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME(MIN.) =	2.75	Tc(MIN.) =	9.35
LONGEST FLOWPATH FROM NODE	23.00	TO NODE	21.00 = 800.10 FEET.

FLOW PROCESS FROM NODE 21.00 TO NODE 20.00 IS CODE = 62

HYDROLOGY REPORT for 3255 Summit Drive

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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 590.00 DOWNSTREAM ELEVATION(FEET) = 576.00
STREET LENGTH(FEET) = 493.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 12.50
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.40
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.39
HALFSTREET FLOOD WIDTH(FEET) = 13.31
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.45
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.75
STREET FLOW TRAVEL TIME(MIN.) = 1.85 Tc(MIN.) = 11.20
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.325
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) = 82
AREA-AVERAGE RUNOFF COEFFICIENT = 0.310
SUBAREA AREA(ACRES) = 9.63 SUBAREA RUNOFF(CFS) = 15.90
TOTAL AREA(ACRES) = 9.80 PEAK FLOW RATE(CFS) = 16.18

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.47 HALFSTREET FLOOD WIDTH(FEET) = 17.31
FLOW VELOCITY(FEET/SEC.) = 5.19 DEPTH*VELOCITY(FT*FT/SEC.) = 2.45
LONGEST FLOWPATH FROM NODE 23.00 TO NODE 20.00 = 1293.10 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 9.80 TC(MIN.) = 11.20
PEAK FLOW RATE(CFS) = 16.18
=====
END OF RATIONAL METHOD ANALYSIS

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3.2 Developed Condition Hydrologic Model Output

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
 2003,1985,1981 HYDROLOGY MANUAL
 (c) Copyright 1982-2007 Advanced Engineering Software (aes)
 Ver. 3.0 Release Date: 06/01/2007 License ID 1574

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
 * HYDROLOGIC ANALYSIS OF THE 100-YEAR 6-HOUR STORM EVENT FOR: *
 * 3255 SUMMIT DRIVE ~ EMBLY - HL #5466 *
 * DEVELOPED CONDITIONS *

FILE NAME: C:\AES\2007-73\100-P4.DAT
 TIME/DATE OF STUDY: 14:29 10/16/2008

 USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
 6-HOUR DURATION PRECIPITATION (INCHES) = 3.400
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
 SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
 NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
 USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167	0.0150
2	20.0	12.5	0.020/0.020/0.020	0.50	1.50 0.0313	0.125	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 1.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

 FLOW PROCESS FROM NODE 13.00 TO NODE 12.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
 S.C.S. CURVE NUMBER (AMC II) = 0
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
 UPSTREAM ELEVATION(FEET) = 646.00
 DOWNSTREAM ELEVATION(FEET) = 629.00
 ELEVATION DIFFERENCE(FEET) = 17.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.601
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.489
 SUBAREA RUNOFF(CFS) = 0.58
 TOTAL AREA(ACRES) = 0.25 TOTAL RUNOFF(CFS) = 0.58

HYDROLOGY REPORT for 3255 Summit Drive

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*****
FLOW PROCESS FROM NODE      12.00 TO NODE      11.00 IS CODE =  52
-----
>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    629.00  DOWNSTREAM(FEET) =    530.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    585.90  CHANNEL SLOPE =    0.1690
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =          0.58
FLOW VELOCITY(FEET/SEC) =    4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =    2.06    Tc(MIN.) =    8.66
LONGEST FLOWPATH FROM NODE      13.00 TO NODE      11.00 =    685.90 FEET.

*****
FLOW PROCESS FROM NODE      11.00 TO NODE      10.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    6.286
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3100
SUBAREA AREA(ACRES) =    3.46  SUBAREA RUNOFF(CFS) =    6.74
TOTAL AREA(ACRES) =    3.7    TOTAL RUNOFF(CFS) =    7.23
TC(MIN.) =    8.66

*****
FLOW PROCESS FROM NODE      11.00 TO NODE      11.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) =    8.66
RAINFALL INTENSITY(INCH/HR) =    6.29
TOTAL STREAM AREA(ACRES) =    3.71
PEAK FLOW RATE(CFS) AT CONFLUENCE =    7.23

*****
FLOW PROCESS FROM NODE      45.00 TO NODE      44.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3300
S.C.S. CURVE NUMBER (AMC II) =    0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    100.00
UPSTREAM ELEVATION(FEET) =    625.00
DOWNSTREAM ELEVATION(FEET) =    613.00
ELEVATION DIFFERENCE(FEET) =    12.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.434
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    7.614
SUBAREA RUNOFF(CFS) =    0.68
TOTAL AREA(ACRES) =    0.27  TOTAL RUNOFF(CFS) =    0.68

*****
FLOW PROCESS FROM NODE      44.00 TO NODE      43.00 IS CODE =  51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    613.00  DOWNSTREAM(FEET) =    593.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    138.85  CHANNEL SLOPE =    0.1440
CHANNEL BASE(FEET) =    1.25  "Z" FACTOR =    1.500
MANNING'S FACTOR = 0.015  MAXIMUM DEPTH(FEET) =    0.50
CHANNEL FLOW THRU SUBAREA(CFS) =    0.68
FLOW VELOCITY(FEET/SEC.) =    6.26  FLOW DEPTH(FEET) =    0.08

```

HYDROLOGY REPORT for 3255 Summit Drive

TRAVEL TIME (MIN.) = 0.37 Tc (MIN.) = 6.80
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 43.00 = 238.85 FEET.

 FLOW PROCESS FROM NODE 43.00 TO NODE 42.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 593.00 DOWNSTREAM (FEET) = 592.00
 CHANNEL LENGTH THRU SUBAREA (FEET) = 48.45 CHANNEL SLOPE = 0.0206
 CHANNEL BASE (FEET) = 4.00 "Z" FACTOR = 4.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH (FEET) = 0.50
 CHANNEL FLOW THRU SUBAREA (CFS) = 0.68
 FLOW VELOCITY (FEET/SEC.) = 1.48 FLOW DEPTH (FEET) = 0.10
 TRAVEL TIME (MIN.) = 0.55 Tc (MIN.) = 7.35
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 42.00 = 287.30 FEET.

 FLOW PROCESS FROM NODE 42.00 TO NODE 41.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 592.00 DOWNSTREAM (FEET) = 574.00
 CHANNEL LENGTH THRU SUBAREA (FEET) = 141.65 CHANNEL SLOPE = 0.1271
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA (CFS) = 0.68
 FLOW VELOCITY (FEET/SEC) = 4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME (MIN.) = 0.50 Tc (MIN.) = 7.85
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 41.00 = 428.95 FEET.

 FLOW PROCESS FROM NODE 41.00 TO NODE 40.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 574.00 DOWNSTREAM (FEET) = 551.00
 CHANNEL LENGTH THRU SUBAREA (FEET) = 293.00 CHANNEL SLOPE = 0.0785
 CHANNEL BASE (FEET) = 4.00 "Z" FACTOR = 4.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH (FEET) = 0.50
 CHANNEL FLOW THRU SUBAREA (CFS) = 0.68
 FLOW VELOCITY (FEET/SEC.) = 2.21 FLOW DEPTH (FEET) = 0.07
 TRAVEL TIME (MIN.) = 2.21 Tc (MIN.) = 10.05
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 40.00 = 721.95 FEET.

 FLOW PROCESS FROM NODE 40.00 TO NODE 11.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 551.00 DOWNSTREAM (FEET) = 530.00
 CHANNEL LENGTH THRU SUBAREA (FEET) = 291.59 CHANNEL SLOPE = 0.0720
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA (CFS) = 0.68
 FLOW VELOCITY (FEET/SEC) = 4.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME (MIN.) = 1.21 Tc (MIN.) = 11.26
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 11.00 = 1013.54 FEET.

 FLOW PROCESS FROM NODE 40.00 TO NODE 11.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.306
 *USER SPECIFIED (SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3300
 S.C.S. CURVE NUMBER (AMC II) = 0

HYDROLOGY REPORT for 3255 Summit Drive

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3300
 SUBAREA AREA(ACRES) = 5.77 SUBAREA RUNOFF(CFS) = 10.10
 TOTAL AREA(ACRES) = 6.0 TOTAL RUNOFF(CFS) = 10.58
 TC(MIN.) = 11.26

 FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 11.26
 RAINFALL INTENSITY(INCH/HR) = 5.31
 TOTAL STREAM AREA(ACRES) = 6.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.58

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/ HOUR)	AREA (ACRE)
1	7.23	8.66	6.286	3.71
2	10.58	11.26	5.306	6.04

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/ HOUR)
1	15.36	8.66	6.286
2	16.68	11.26	5.306

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 16.68 Tc(MIN.) = 11.26
 TOTAL AREA(ACRES) = 9.8
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 11.00 = 1013.54 FEET.

 FLOW PROCESS FROM NODE 11.00 TO NODE 10.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 530.00 DOWNSTREAM(FEET) = 500.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 277.01 CHANNEL SLOPE = 0.1083
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) = 16.68
 FLOW VELOCITY(FEET/SEC) = 9.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 11.77
 LONGEST FLOWPATH FROM NODE 45.00 TO NODE 10.00 = 1290.55 FEET.

+-----+
 | END ANALYSIS OF EASTERLY BASIN |
 | BEGIN ANALYSIS OF WESTERLY BASIN |
 |
 +-----+

 FLOW PROCESS FROM NODE 23.00 TO NODE 22.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

*USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
 S.C.S. CURVE NUMBER (AMC II) = 0
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
 UPSTREAM ELEVATION(FEET) = 658.00
 DOWNSTREAM ELEVATION(FEET) = 646.00
 ELEVATION DIFFERENCE(FEET) = 12.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.601

HYDROLOGY REPORT for 3255 Summit Drive

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.489
 SUBAREA RUNOFF(CFS) = 0.39
 TOTAL AREA(ACRES) = 0.17 TOTAL RUNOFF(CFS) = 0.39

 FLOW PROCESS FROM NODE 22.00 TO NODE 21.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	646.00	DOWNSTREAM(FEET) =	590.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	700.10	CHANNEL SLOPE =	0.0800
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION			
CHANNEL FLOW THRU SUBAREA(CFS) =	0.39		
FLOW VELOCITY(FEET/SEC) =	4.24	(PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)	
TRAVEL TIME(MIN.) =	2.75	Tc(MIN.) =	9.35
LONGEST FLOWPATH FROM NODE	23.00 TO NODE	21.00 =	800.10 FEET.

 FLOW PROCESS FROM NODE 22.00 TO NODE 21.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	5.982
*USER SPECIFIED(SUBAREA):	
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.3100
S.C.S. CURVE NUMBER (AMC II) =	0
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3100
SUBAREA AREA(ACRES) =	5.45 SUBAREA RUNOFF(CFS) = 10.11
TOTAL AREA(ACRES) =	5.6 TOTAL RUNOFF(CFS) = 10.42
TC(MIN.) =	9.35

 FLOW PROCESS FROM NODE 21.00 TO NODE 20.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<

=====

UPSTREAM ELEVATION(FEET) =	590.00	DOWNSTREAM ELEVATION(FEET) =	576.00
STREET LENGTH(FEET) =	493.00	CURB HEIGHT(INCHES) =	6.0
STREET HALFWIDTH(FEET) =	20.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =	12.50
INSIDE STREET CROSSFALL(DECIMAL) =	0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =	0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =	1
STREET PARKWAY CROSSFALL(DECIMAL) =	0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =	0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =	0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =	10.79
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:	
STREET FLOW DEPTH(FEET) =	0.42
HALFSTREET FLOOD WIDTH(FEET) =	14.68
AVERAGE FLOW VELOCITY(FEET/SEC.) =	4.75
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =	1.99
STREET FLOW TRAVEL TIME(MIN.) =	1.73 Tc(MIN.) = 11.08
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	5.361
*USER SPECIFIED(SUBAREA):	
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.3100
S.C.S. CURVE NUMBER (AMC II) =	0
AREA-AVERAGE RUNOFF COEFFICIENT =	0.310
SUBAREA AREA(ACRES) =	0.44 SUBAREA RUNOFF(CFS) = 0.73
TOTAL AREA(ACRES) =	6.1 PEAK FLOW RATE(CFS) = 10.42

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) =	0.42	HALFSTREET FLOOD WIDTH(FEET) =	14.48
FLOW VELOCITY(FEET/SEC.) =	4.70	DEPTH*VELOCITY(FT*FT/SEC.) =	1.96
LONGEST FLOWPATH FROM NODE	23.00 TO NODE	20.00 =	1293.10 FEET.

HYDROLOGY REPORT for 3255 Summit Drive

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*****
FLOW PROCESS FROM NODE      20.00 TO NODE      20.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =   2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM   1 ARE:
TIME OF CONCENTRATION(MIN.) =   11.08
RAINFALL INTENSITY(INCH/HR) =   5.36
TOTAL STREAM AREA(ACRES) =   6.06
PEAK FLOW RATE(CFS) AT CONFLUENCE =   10.42

*****
FLOW PROCESS FROM NODE      37.00 TO NODE      36.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) =   0
INITIAL SUBAREA FLOW-LENGTH(FEET) =  100.00
UPSTREAM ELEVATION(FEET) =   625.00
DOWNSTREAM ELEVATION(FEET) =   612.00
ELEVATION DIFFERENCE(FEET) =   13.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =   6.601
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.489
SUBAREA RUNOFF(CFS) =   1.28
TOTAL AREA(ACRES) =   0.55  TOTAL RUNOFF(CFS) =   1.28

*****
FLOW PROCESS FROM NODE      36.00 TO NODE      35.00 IS CODE =  52
-----
>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   612.00  DOWNSTREAM(FEET) =   595.90
CHANNEL LENGTH THRU SUBAREA(FEET) =   135.80  CHANNEL SLOPE =  0.1186
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) =   1.28
FLOW VELOCITY(FEET/SEC) =   4.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   0.46  Tc(MIN.) =   7.06
LONGEST FLOWPATH FROM NODE      37.00 TO NODE      35.00 =   235.80 FEET.

*****
FLOW PROCESS FROM NODE      36.00 TO NODE      35.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.173
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3100
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3100
SUBAREA AREA(ACRES) =   0.54  SUBAREA RUNOFF(CFS) =   1.20
TOTAL AREA(ACRES) =   1.1  TOTAL RUNOFF(CFS) =   2.42
TC(MIN.) =   7.06

*****
FLOW PROCESS FROM NODE      35.00 TO NODE      34.00 IS CODE =  51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   595.50  DOWNSTREAM(FEET) =   594.90
CHANNEL LENGTH THRU SUBAREA(FEET) =   88.52  CHANNEL SLOPE =  0.0068
CHANNEL BASE(FEET) =   4.00  "Z" FACTOR =  4.000
MANNING'S FACTOR = 0.030  MAXIMUM DEPTH(FEET) =   0.50
CHANNEL FLOW THRU SUBAREA(CFS) =   2.42
FLOW VELOCITY(FEET/SEC.) =   1.59  FLOW DEPTH(FEET) =   0.29

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HYDROLOGY REPORT for 3255 Summit Drive

TRAVEL TIME (MIN.) = 0.93 Tc (MIN.) = 7.99
 LONGEST FLOWPATH FROM NODE 37.00 TO NODE 34.00 = 324.32 FEET.

 FLOW PROCESS FROM NODE 34.00 TO NODE 33.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	594.90	DOWNSTREAM (FEET) =	594.29
CHANNEL LENGTH THRU SUBAREA (FEET) =	121.17	CHANNEL SLOPE =	0.0050
CHANNEL BASE (FEET) =	4.00	"Z" FACTOR =	4.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	0.50
CHANNEL FLOW THRU SUBAREA (CFS) =	2.42		
FLOW VELOCITY (FEET/SEC.) =	1.42	FLOW DEPTH (FEET) =	0.32
TRAVEL TIME (MIN.) =	1.43	Tc (MIN.) =	9.41
LONGEST FLOWPATH FROM NODE 37.00 TO NODE 33.00 =	445.49	FEET.	

 FLOW PROCESS FROM NODE 33.00 TO NODE 32.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	594.29	DOWNSTREAM (FEET) =	584.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	146.42	CHANNEL SLOPE =	0.0703
CHANNEL BASE (FEET) =	4.00	"Z" FACTOR =	4.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	0.50
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	5.704		
*USER SPECIFIED (SUBAREA):			
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.3300		
S.C.S. CURVE NUMBER (AMC II) =	0		
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =	3.02		
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =	3.73		
AVERAGE FLOW DEPTH (FEET) =	0.17	TRAVEL TIME (MIN.) =	0.65
Tc (MIN.) =	10.07		
SUBAREA AREA (ACRES) =	0.63	SUBAREA RUNOFF (CFS) =	1.19
AREA-AVERAGE RUNOFF COEFFICIENT =	0.317		
TOTAL AREA (ACRES) =	1.7	PEAK FLOW RATE (CFS) =	3.11

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH (FEET) = 0.18 FLOW VELOCITY (FEET/SEC.) = 3.70
 LONGEST FLOWPATH FROM NODE 37.00 TO NODE 32.00 = 591.91 FEET.

 FLOW PROCESS FROM NODE 32.00 TO NODE 31.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	584.00	DOWNSTREAM (FEET) =	583.48
CHANNEL LENGTH THRU SUBAREA (FEET) =	50.45	CHANNEL SLOPE =	0.0103
CHANNEL BASE (FEET) =	10.00	"Z" FACTOR =	1.000
MANNING'S FACTOR =	0.015	MAXIMUM DEPTH (FEET) =	0.50
CHANNEL FLOW THRU SUBAREA (CFS) =	3.11		
FLOW VELOCITY (FEET/SEC.) =	2.46	FLOW DEPTH (FEET) =	0.12
TRAVEL TIME (MIN.) =	0.34	Tc (MIN.) =	10.41
LONGEST FLOWPATH FROM NODE 37.00 TO NODE 31.00 =	642.36	FEET.	

 FLOW PROCESS FROM NODE 31.00 TO NODE 30.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	583.48	DOWNSTREAM (FEET) =	581.29
CHANNEL LENGTH THRU SUBAREA (FEET) =	218.91	CHANNEL SLOPE =	0.0100
CHANNEL BASE (FEET) =	4.00	"Z" FACTOR =	4.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	0.50
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	5.077		
*USER SPECIFIED (SUBAREA):			

HYDROLOGY REPORT for 3255 Summit Drive

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3300
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.83
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/sec.) = 2.21
AVERAGE FLOW DEPTH(Feet) = 0.39 TRAVEL TIME(MIN.) = 1.65
Tc(MIN.) = 12.06
SUBAREA AREA(ACRES) = 2.04 SUBAREA RUNOFF(CFS) = 3.42
AREA-AVERAGE RUNOFF COEFFICIENT = 0.324
TOTAL AREA(ACRES) = 3.8 PEAK FLOW RATE(CFS) = 6.19

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.45 FLOW VELOCITY(Feet/sec.) = 2.39
LONGEST FLOWPATH FROM NODE 37.00 TO NODE 30.00 = 861.27 FEET.

FLOW PROCESS FROM NODE 30.00 TO NODE 20.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

=====
ELEVATION DATA: UPSTREAM(Feet) = 581.29 DOWNSTREAM(Feet) = 576.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 19.67 CHANNEL SLOPE = 0.2689
NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 6.19
FLOW VELOCITY(Feet/sec) = 7.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 12.10
LONGEST FLOWPATH FROM NODE 37.00 TO NODE 20.00 = 880.94 FEET.
=====

FLOW PROCESS FROM NODE 20.00 TO NODE 20.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 12.10
RAINFALL INTENSITY(INCH/HR) = 5.06
TOTAL STREAM AREA(ACRES) = 3.76
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.19
=====

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	10.42	11.08	5.361	6.06
2	6.19	12.10	5.065	3.76

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	16.09	11.08	5.361
2	16.03	12.10	5.065

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 16.09 Tc(MIN.) = 11.08
TOTAL AREA(ACRES) = 9.8
LONGEST FLOWPATH FROM NODE 23.00 TO NODE 20.00 = 1293.10 FEET.

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 9.8 TC(MIN.) = 11.08
PEAK FLOW RATE(CFS) = 16.09
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END OF RATIONAL METHOD ANALYSIS